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# Survey of United States Great Lakes Basin Farmers Regarding Water Pollution From Agricultural Activities

International Joint Commission-United States and Canada, Windsor (Ontario)

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Nov 77

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REFERENCE GROUP
S POLLUTION
E ACTIVITIES

INTERNATIONAL JOINT COMMISSION

# SURVEY OF UNITED STATES GREAT LAKES BASIN FARMERS REGARDING WATER POLLUTION FROM AGRICULTURAL ACTIVITIES

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Approximately 900 farmers in the U.S. Great Lakes Basin were interviewed in July 1977 to discover their opinions concerning the effect on water quality of certain agricultural activities, their attitudes about pollution abatement issues, their use of various conservation practices, and the factors which prompt their conservation activities.

A stratified area sampling frame was used to ensure reliable representation of farmers in the Region. Half of the farmers were interviewed in person, nearly 40% were contacted by telephone, and the remainder could not be contacted or refused to be interviewed.

Survey results were analyzed and findings reported include: most farmers believe that no relationship exists between farm fertilizers/pesticides, manure, or eroded soil, and Great Lakes water quality; nearly 90% use conservation practices; 57% favor local government administered regulations;70% favor voluntary controls; 75% say farmers need more information on controlling water pollution on their farms.

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# SURVEY OF U.S. GREAT LAKES BASIN FARMERS REGARDING WATER POLLUTION FROM AGRICULTURAL ACTIVITIES

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Washington, D.C.

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November 1977

Funded through Interagency Agreement (IAG #D7-F1220) between the U.S. Environmental Protection Agency and the Great Lakes Basin Commission as support for the International Reference Group on GREAT LAKES POLLUTION FROM LAND USE ACTIVITIES of the International Joint Commission

# ACKNOWLEDGEMENTS

The study discussed in this Report was carried out as part of the efforts of the Pollution from Land Use Activities Reference Group, an organization of the International Joint Commission, established under the Canada-U.S. Great Lakes Water Quality Agreement of 1972. Funding was provided through the U.S. Environmental Protection Agency to the Statistical Reporting Service, U.S. Department of Agriculture, which conducted the survey of farmers in the U.S. portion of the Great Lakes Basin, and to the Great Lakes Basin Commission for the staff to analyze and report the results.

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# DISCLAIMER

The study discussed in this Report was carried out as part of the efforts of the Pollution from Land Use Activities Reference Group, an organization of the International Joint Commission, established under the Canada-U.S. Great Lakes Water Quality Agreement of 1972. Funding was provided through the U.S. Environmental Protection Agency. Findings and conclusions are those of the authors and do not necessarily reflect the views of the Reference Group or its recommendations to the Commission.

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# EXECUTIVE SUMMARY

The survey of farmers in the U.S. Great Lakes Basin regarding water pollution from agricultural activities was conducted in July 1977 to discover farmers' opinions concerning the effect on water quality of certain agricultural activities and farmers' attitudes concerning pollution abatement issues. In addition, farmers were asked about their use of various conservation practices and the factors which prompt this conservation activity.

The survey was conducted for the Pollution from Land Use Activities Reference Group (PLUARG) of the International Joint Commission (IJC), the U.S.-Canadian agency having concern for common boundary waters. The Statistical Reporting Service of the U.S. Department of Agriculture designed and conducted the survey of farmers in the U.S. portion of the Great Lakes Basin and staff from the Great Lakes Basin Commission analyzed the results.

Approximately 900 farmers were chosen to be interviewed using a stratified area sampling frame to ensure reliable representation of farmers in the Region. Half of the farmers were interviewed in person, nearly 40% were contacted by telephone, and the remainder could not be contacted or refused to be interviewed. Results reflect activities and opinions of all farmers in the U.S. Great Lakes Basin.

Analysis of survey results reveal:

1. Field crops provide the main income for about half of the farmers in the U.S. Great Lakes Basin; most of the remainder are principally livestock and poultry farmers; about 5% derive most of their income from fruits and vegetables. Nearly three out of four farmers own some livestock or poultry.

2. More than half of the farmers in the Basin report gross annual sales of less than $10,000. Many of the Great Lakes Basin farms may be small operations.

3. Eight out of ten farmers mention newspapers and magazines as one of their sources of information on water pollution; seven out of ten identify radio or television.

4. Nearly 90% of the farmers in the region follow some kind of conservation practice. The major factors prompting the use of conservation practices are soil conservation and increased yield or production. Half of the farmers state that they are following a conservation plan; about 40 percent say they are a cooperator of their local soil conservation district.

5. Most farmers believe that no relationship exists between farm fertilizers/pesticides, manure, or eroded soil, and Great Lakes water quality. Only 19 percent are of the opinion that manure contributes to pollution of the Great Lakes; 32 percent believe that fertilizers and pesticides used in farming are pollutants; and almost half consider eroded soil a contributor to Great Lakes pollution.

In the survey, questions were asked about issues which PLUARG will address as it drafts recommendations to the International Joint Commission. The following survey results should be considered in designing a remedial program:

1. The majority (57%) of farmers express the opinion that local government would do the best job of administering regulations, if they are needed.

2. Seven out of ten U.S. Great Lakes Basin farmers believe it is best to rely on voluntary cooperation of farmers with regard to control of water pollution resulting from agricultural activities.

3. Three-quarters of the farmers in the Basin agree that farmers need more information on how they can control water pollution on their farms.

4. Two-thirds believe the Federal Government should help pay for pollution control on farms.

# INTRODUCTION

## OVERVIEW OF SURVEY'S RELATIONSHIP TO PLUARG

The survey of farmers in the U.S. Great Lakes Basin regarding water pollution from agricultural activities was conducted as an activity of the Pollution from Land Use Activities Reference Group (PLUARG), which was established by the Great Lakes Water Quality Agreement of 1972 between the United States and Canada. The overall purpose of PLUARG is to assess whether the boundary waters of the Great Lakes system are being polluted by land use activities and, if so, where and to what extent, and what measures will provide improvements in controlling pollutants from land usage.

Four tasks were identified by the Reference Group. Task A, of which this survey is an activity, has the following objective:

> To assess problems, management programs, and research, and to attempt to set priorities in relation to the best information now available on the effects of land use activities on water quality in boundary waters of the Great Lakes.

In addition, Task A's purpose is to examine options for remedying pollution from both a technical and social perspective, and to assess the probable costs of such remedies. The survey results will help determine which of the technical options are socially acceptable.

## PURPOSE AND INTENT OF SURVEY

The survey was developed to help PLUARG: (1) assess the level of awareness among farmers in the U.S. Great Lakes Basin of land use/water quality relationships; (2) discover to what extent these farmers follow certain conservation practices and their willingness to participate in water pollution abatement programs; and (3) identify the most important factors in bringing about the adoption of conservation practices.

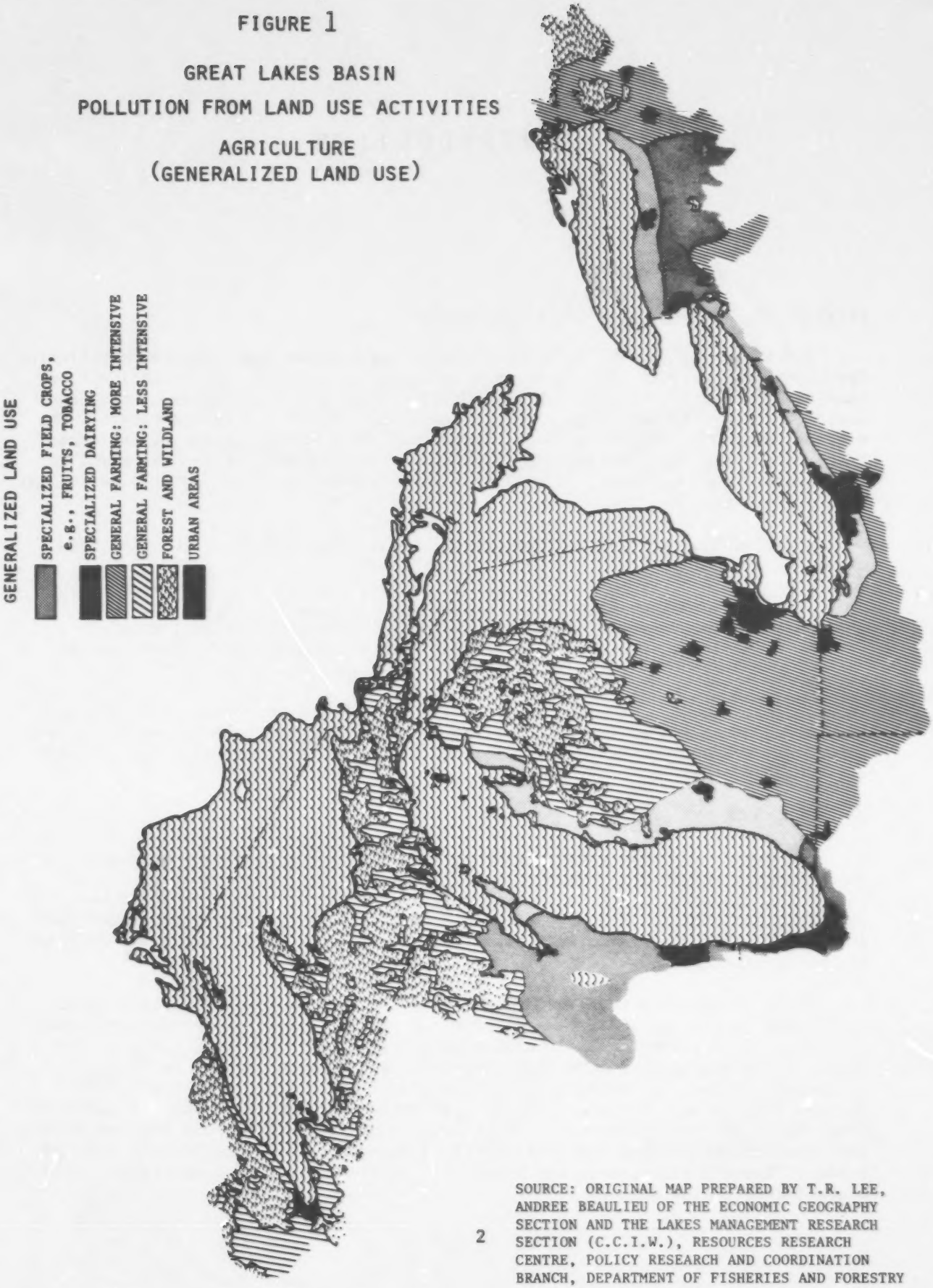
Although much has been researched and written about the urban population, little information is available on the rural and agricultural residents and their opinions. This survey may help shed some light on this important group in the Basin. Knowledge gained from this study will aid in recommending socially acceptable options for water pollution abatement programs. It is hoped that, through this survey, the attitudes and perceptions of people who may be unable to participate more actively may be considered in designing a water pollution abatement program which takes into account the diverse natural characteristics in the Basin. Figure 1 illustrates the location of various types of agriculture and its predominance in the Region.

FIGURE 1

GREAT LAKES BASIN

POLLUTION FROM LAND USE ACTIVITIES

AGRICULTURE
(GENERALIZED LAND USE)




SOURCE: ORIGINAL MAP PREPARED BY T.R. LEE, ANDREE BEAULIEU OF THE ECONOMIC GEOGRAPHY SECTION AND THE LAKES MANAGEMENT RESEARCH SECTION (C.C.I.W.), RESOURCES RESEARCH CENTRE, POLICY RESEARCH AND COORDINATION BRANCH, DEPARTMENT OF FISHERIES AND FORESTRY

# SURVEY METHODOLOGY

The survey was conducted in July 1977 by the Statistical Reporting Service (SRS), U.S. Department of Agriculture (USDA), in conjunction with the follow-up of its 1977 June Enumerative Survey (JES).

The universe was indentified as all *resident farm operators** on land comprising the U.S. Great Lakes Basin (GLB). The survey used a stratified area sampling frame of *resident farm operators** who were operating a *farm** at the time of the 1977 JES. Data were collected from approximately 900 *farm operators,** the majority (51%) of whom were interviewed in person. Thirty-eight percent were interviewed by telephone and 11% could not be contacted or refused to be interviewed. Interview results were expanded to reflect total farms for the entire U.S. Great Lakes Basin. The expansion process involved multiplying the collected data by a factor based on intensity of agricultural use in the particular geographic area sampled. The result then was adjusted by a non-response factor for that geographic area.

## QUESTIONNAIRE

The survey consisted of 16 questions concerning opinions on land use/water quality relationships, agricultural practices followed, reasons for practicing conservation measures, sources of information on pollution issues, and attitudes regarding water pollution abatement programs.

A copy of the questionnaire and the results follow. Question 9 was ambiguous to respondents and results have limited usage. The response percentages are shown next to the specific answers. For example, in the first question, 32.2% of the resident farm operators are of the opinion that fertilizers/pesticides used in farming contribute to water pollution of the Great Lakes.

---

*See glossary for definition of *farm, farm operator,* and *resident farm operator.*

# TABLE 1

Crop Reporting Board
Statistical Reporting Service
U.S. Department of Agriculture
Washington, D.C.

Form Approved
OMB Number 40S-77014
Approval Expires 12-31-77

## GREAT LAKES POLLUTION SURVEY

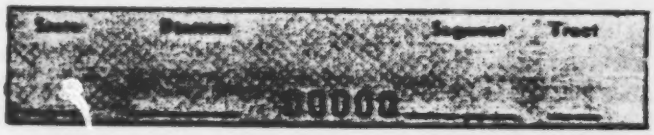
July 1977

INTRODUCTION:

We are conducting a survey to determine farmers' attitudes about water pollution and identify factors related to conservation practices currently being carried out in the Great Lakes Basin. Response to this survey is voluntary and not required by law. However, this survey was requested by the Governments of the United States and Canada to carry out the Great Lakes Water Quality Agreement of 1972. Your individual response will remain confidential and be combined with all others to arrive at totals for the Great Lakes Basin.

Segment Number: _____ Tract Letter: _____

County: _____




RESULTS

| Question | U.S. GREAT LAKES BASIN FARMERS' RESPONSES (%'s) Yes | No | No Opinion |
|---|---|---|---|
| 1. In your opinion, does fertilizer and pesticide used in farming contribute to water pollution of the Great Lakes? | 32.2% | 57.1% | 10.7% |
| 2. In your opinion, does manure from livestock and poultry operations contribute to water pollution of the Great Lakes? | 19.2 | 76.1 | 4.7 |
| 3. In your opinion, does eroded soil contribute to water pollution of the Great Lakes? | 44.9 | 46.1 | 8.9 |

| 4. In your opinion who would do a better job of administering regulations, if they are needed, Federal, State or Local Government? | Yes |
|---|---|
| Local Government | 56.5 |
| State Government | 17.5 |
| Federal Government | 12.4 |
| No opinion | 13.6 |

The following statements reflect opinions that different people have about pollution issues. Please indicate whether you agree or disagree with each statement.

| | Agree | Disagree | No opinion |
|---|---|---|---|
| 5. "To solve farm-related water pollution problems, it is best to rely on the voluntary cooperation of farmers." | 70.6% | 21.8% | 7.6% |
| 6. "Farmers need more information on how they can control water pollution." | 76.9 | 17.8 | 5.8 |
| 7. "Farmers should pay the entire cost of controlling water pollution created by their own operations." | 30.6 | 60.4 | 9.0 |
| 8. "The Federal government should help pay for pollution control on farms." | 66.9 | 25.7 | 7.4 |
| 9. "Manure is nothing more than a waste disposal problem."* | - | - | - |

| | Yes | No |
|---|---|---|
| 10. a. Do you practice CROP ROTATION using grain or hay crops to control soil erosion on your farm? | 73.8% | 26.2% |
| b. Do you LEAVE CROP RESIDUE on land over the winter? | 62.7 | 37.3 |
| c. Do you practice NO TILL cultivation? | 9.4 | 90.6 |
| d. Do you PLOW ON the CONTOUR? | 24.3 | 75.7 |
| e. Do you have GRASSED WATERWAYS on your farm to control soil erosion? | 43.5 | 56.5 |
| f. Do you have any TERRACING or WATER DIVERSION on your farm? | 14.3 | 85.7 |
| g. Do you use any OTHER PRACTICE to control soil erosion on your farm? | 19.4 | 80.6 |

*This question was ambiguous to respondents. Because the results have limited usage, they have not been included.

11. For each practice checked YES in question 10, ask the reason the practice is used and code the most important reason.

| REASONS FOR PRACTICE | Yes |
|---|---|
| Conserve Soil | 75.6% |
| Increase Yield and Production | 48.7 |
| Comply with State or Local Regulation | 0.1 |
| Cost-Share Funds Available | 0.2 |
| Other Reason | 7.9 |

12. How close to the bank of a clearly defined stream or ditch do you usually cultivate?

| | Yes |
|---|---|
| Less than 10 feet | 22.7% |
| 10 feet or more | 37.9 |
| No clearly defined stream or ditch beside those fields cultivated. | 39.4 |

| | Yes | No | No Answer |
|---|---|---|---|
| 13. Do you have any livestock or poultry NOW? | 71.6% | 28.4% | - |
| 14. Are you following a current conservation plan for your farm? | 49.6 | 47.6 | 2.8 |
| 15. Are you a cooperator (participant) of your local soil conservation district? | 39.3 | 58.2 | 2.4 |

16. Where do you get information about water pollution? (Check all sources reported)

| | Yes |
|---|---|
| Newspaper and magazine | 79.6% |
| Radio | 35.0 |
| Television | 37.2 |
| Farm Organization Meetings | 24.1 |
| Government publications or meeting with Government personnel | 40.9 |
| Other | 8.3 |

| 17. Response Code | Yes |
|---|---|
| Telephone interview | 38.3% |
| Personal interview | 50.5 |
| Refusal (or not available) | 11.1 |

## GEOGRAPHIC BOUNDARIES

For this survey the U.S. Great Lakes Basin was defined as including all counties with at least half their land within the hydrologic boundary of the Basin. Counties included all those in the State of Michigan, 27 in Ohio, 26 in Wisconsin, 21 in New York, 7 in Indiana, and 4 in Minnesota. A list of these counties appears below. Excluded were counties bordering the Lakes in Illinois and Pennsylvania which are basically non-agricultural, and counties with more than half their land outside the Basin.

### TABLE 2
### COUNTIES INCLUDED IN SURVEY OF U.S. GREAT LAKES BASIN FARMERS, 1977

| ILLINOIS | NEW YORK | OHIO | WISCONSIN |
|---|---|---|---|
| None | Allegany | Ashtabula | Ashland |
| | Cayuga | Allen | Bayfield |
| INDIANA | Erie | Auglaize | Brown |
| Adams | Genesee | Crawford | Calumet |
| Allen | Jefferson | Cuyahoga | Door |
| De Kalb | Lewis | Defiance | Florence |
| Elkhart | Livingston | Erie | Fond du Lac |
| Lagrange | Madison | Fulton | Forest |
| Noble | Monroe | Geauga | Green Lake |
| Steuben | Niagara | Hancock | Iron |
| | Oneida | Henry | Kewaunee |
| MICHIGAN | Onondaga | Huron | Langlade |
| All Counties | Ontario | Lake | Manitowoc |
| | Orleans | Lorain | Marinette |
| MINNESOTA | Oswego | Lucas | Marquette |
| Carlton | Schuyler | Medina | Milwaukee |
| Cook | Seneca | Ottawa | Oconto |
| Lake | Tompkins | Paulding | Outagamie |
| St. Louis | Wayne | Portage | Ozaukee |
| | Wyoming | Putnam | Racine |
| PENNSYLVANIA | Yates | Sandusky | Shawano |
| None | | Seneca | Sheboygan |
| | | Summit | Washington |
| | | Van Wert | Waupaca |
| | | Williams | Waushara |
| | | Wood | Winnebago |
| | | Wyandot | |

# RESULTS AND DISCUSSION

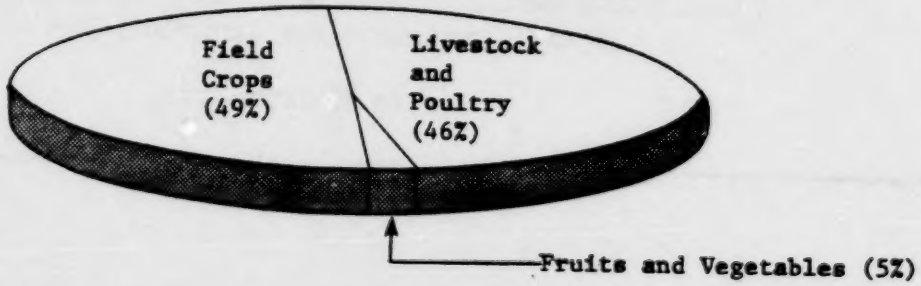
## CHARACTERISTICS OF RESPONDENTS

### Farm Type*

There are approximately 191,700 resident farm operators in the U.S. Great Lakes Basin (GLB). Of these, almost half (49%) produce *field crops** as the major source of income. Nearly another half (46%) raise *livestock and poultry** as the major source of income, although nearly three-quarters of all farmers (72%) own some livestock and poultry. *Vegetable and fruit** producers account for the remaining five percent. Figure 2 illustrates the percentages of different farm types.

FIGURE 2

TYPES OF U.S. GREAT LAKES BASIN FARMS OPERATED IN 1976, BASED ON PRINCIPAL PRODUCT



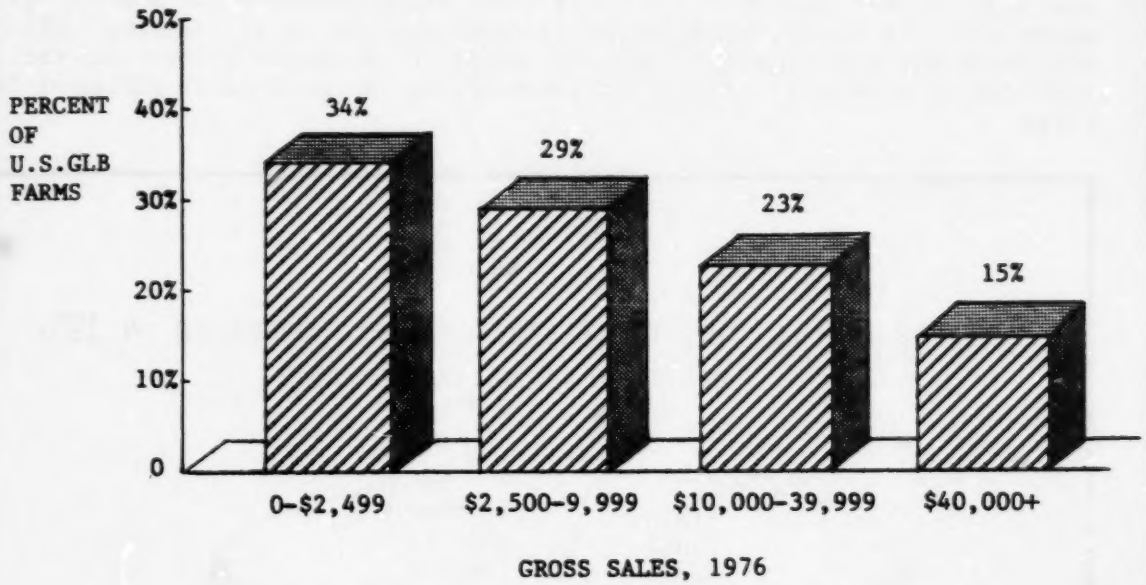

*Definitions of *farm type*, *field crops*, *livestock and poultry*, and *vegetable and fruit* farms appear in the glossary.

Gross Farm Sales

About one-third of the respondents report gross sales of less than $2,500 and over 60% report gross sales of less than $10,000 in 1976. Only 15% have agricultural sales of more than $40,000. Figure 3 shows these proportions.

FIGURE 3

U.S. GREAT LAKES BASIN FARMS (1977) BY GROSS SALES (1976)



## FARMERS' SOURCES OF INFORMATION ABOUT WATER POLLUTION

### Farmers' Sources of Information

When asked about their sources for water pollution information, 80% of the farmers identified newspapers and magazines, 41% mentioned government representatives and publications, 37% television, 35% radio, and 24% cited farm organization meetings. Although there are some differences when comparing answers by farm types, those differences are not great. Most farmers obtain information about water pollution from newspapers and magazines, regardless of what type of farm they operate (see Table 3).

### TABLE 3

### FARMERS' SOURCES OF INFORMATION ABOUT WATER POLLUTION BY FARM TYPE, 1977

| FARM TYPE | SOURCES OF INFORMATION* | | | | | |
|---|---|---|---|---|---|---|
| | News., Mags. | Radio | TV | Farm Orgs. | Gov't | Other |
| Field Crops | 79% | 36% | 39% | 21% | 41% | 9% |
| Vegetable & Fruit | 73 | 28 | 31 | 36 | 63 | 8 |
| Livestock & Poultry | 81 | 35 | 36 | 26 | 38 | 8 |
| ALL U.S. GLB FARMERS | 80% | 35% | 37% | 24% | 41% | 8% |

*Note that row percentages would add to more than 100%. This is because each respondent was allowed to identify more than one source of information. Each percentage is the proportion of operators of a farm type who cited a particular source of information. For example, 79% of farmers with field crops identified newspapers and magazines as sources of information about water pollution.

Vegetable and fruit farmers do seem to differ from the other farm types regarding their sources of information in that a much higher percentage of them receive water pollution information from government sources, as compared to all GLB farmers. However, because the number of vegetable and fruit farmers interviewed was so small, actual percentages of farmers using each information source may differ from these sample indicators.

Farmers' Sources of Information by Gross Farm Sales

Most farmers obtain their information about water pollution from newspapers and magazines, regardless of the amount of gross sales generated. There may be a relationship between gross farm sales and source of information about water pollution, however, as over half (51%) of the operators of farms with the greatest sales receive information about water pollution from government sources (see Table 4).

## TABLE 4

## FARMERS' SOURCES OF INFORMATION ABOUT WATER POLLUTION BY GROSS FARM SALES, 1977

| GROSS FARM SALES, 1976 | SOURCES OF INFORMATION* | | | | | |
|---|---|---|---|---|---|---|
| | News., Mags. | Radio | TV | Farm Orgs. | Gov't | Other |
| Less than $2,500 | 78% | 35% | 42% | 16% | 37% | 9% |
| $2,500-$9,999 | 80 | 33 | 37 | 23 | 42 | 10 |
| $10,000-$39,999 | 83 | 39 | 36 | 29 | 39 | 6 |
| $40,000 and over | 77 | 33 | 29 | 39 | 51 | 8 |
| ALL U.S. GLB FARMERS | 80% | 35% | 37% | 24% | 41% | 8% |

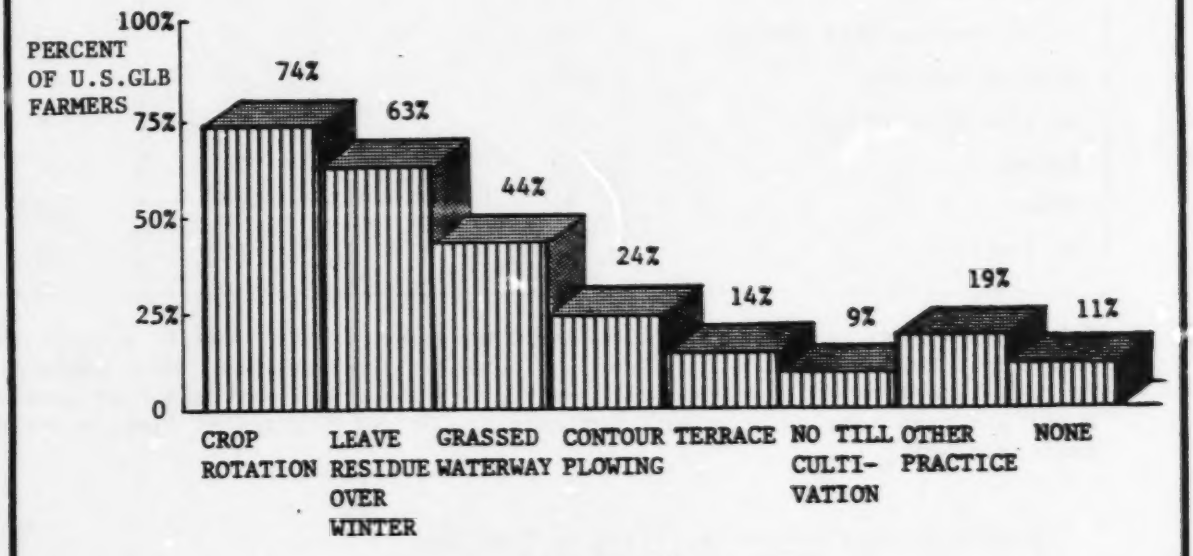
*Note that row percentages would add to more than 100%. This is because each respondent was allowed to identify more than one source. Each percentage is the proportion of farmers grossing a certain amount who identified a certain source of information. For example, 78% of farmers grossing less than $2,500 get their information about pollution from newspapers and magazines.

## CONSERVATION PRACTICES FOLLOWED

Approximately 89% of U.S. Great Lakes Basin farmers practice some conservation, with the largest percentages rotating crops (74%) or leaving crop residue on the land over winter (63%). Figure 4 illustrates the frequency of various conservation practices followed by farmers in the U.S. Great Lakes Basin.

FIGURE 4

CONSERVATION PRACTICES FOLLOWED BY FARMERS IN THE U.S. GREAT LAKES BASIN, 1977



## Conservation Practices by Farm Type

The conservation practices followed do not seem to depend to any great extent on the type of farm, although vegetable and fruit farmers differ slightly, in that a much smaller percentage rotate crops as compared to operators of other types of farms (see Table 5).

### TABLE 5

### CONSERVATION PRACTICE BY TYPE OF FARM, 1977

| CONSERVATION PRACTICE | TYPE OF FARM* | | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|
| | Field Crops | Vegetable & Fruit | Livestock & Poultry | |
| Contour Plowing | 22% | 28% | 27% | 24% |
| Crop Rotation | 77 | 51 | 74 | 74 |
| Leave Residue Over Winter | 68 | 60 | 57 | 63 |
| Grassed Waterway | 41 | 53 | 45 | 44 |
| No Till Cultivation | 11 | 8 | 8 | 9 |
| Terrace | 13 | 25 | 14 | 14 |
| Other | 20 | 27 | 18 | 19 |
| No Practice | 9 | 14 | 12 | 11 |

*Note that column percentages would add to more than 100%. This is because each respondent could identify more than one conservation practice. Each percentage is the proportion of operators of a particular farm type who said they practice a certain conservation measure. For example, 22% of farmers of field crops use contour plowing.

## Distance Cultivated from Stream by Farm Type

Among those farmers who stated there is a clearly defined stream or ditch beside their cultivated fields, 63% said that they cultivate 10 or more feet from that stream; 37% say they cultivate less than 10 feet away.

Conservation Practices by Gross Farm Sales

The percentage of farmers practicing conservation increases as gross sales increase, although farms in all sales categories have a high percentage practicing conservation. Of those farmers generating less than $2,500 in gross sales, 78% practice some conservation measures. Of those earning $2,500-9,999, 93% practice conservation measures; 96% of the farmers in both the $10,000-39,000 bracket and the highest bracket ($40,000 and over) practice some conservation. More of the farms with smallest gross sales (31%) than other farms are contour plowed. More of the farms grossing $2,500-9,999 (71%) than other farms leave crop residue on their fields over winter (see Table 6).

## TABLE 6

## CONSERVATION PRACTICE, BY GROSS SALES, 1976

| CONSERVATION PRACTICE | GROSS FARM SALES* | | | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|
| | Less Than $2,500 | $2,500-9,999 | $10,000-39,999 | $40,000 and Over | |
| Contour Plowing | 31% | 20% | 21% | 22% | 24% |
| Crop Rotation | 57 | 78 | 86 | 87 | 74 |
| Leave Residue Over Winter | 51 | 71 | 68 | 65 | 63 |
| Grassed Waterway | 39 | 44 | 39 | 60 | 44 |
| No Till Cultivation | 8 | 12 | 9 | 10 | 9 |
| Terrace | 13 | 10 | 16 | 24 | 14 |
| Other | 13 | 18 | 23 | 32 | 19 |
| No Practice | 22 | 7 | 4 | 4 | 11 |

*Note that column percentages would add to more than 100%. This is because each respondent was allowed to identify more then one conservation practice. Each percentage is the proportion of farmers in a particular category by gross sales who said they practice a certain conservation measure. For example, 31% of the farmers grossing less than $2,500 a year from their farm operations contour plow.

## Conservation Practices by Involvement with Local Soil Conservation District and Development of a Conservation Plan

While 89% of all U.S. Great Lakes Basin farmers practice soil conservation measures, only 50% said they are following a current conservation plan. Only 39% are cooperators of their local soil conservation district (SCD). If a farmer is an SCD cooperator, it is likely that he/she is also following a conservation plan. Of SCD cooperators, nearly three-quarters said they follow a plan. Incidentally, SCD cooperators are encouraged to develop a plan as part of their involvement with the local district.

Apparently, farmers who are either SCD cooperators or following a conservation plan are more likely to practice conservation measures than those who are neither. Of SCD cooperators, 96% follow some conservation practices; of those who are not cooperators, 85% practice conservation. Of those who stated they follow a conservation plan, 95% use some conservation practices, but 83% of those not following a plan practice conservation. For each conservation practice, higher percentages are shown for those either cooperating with their SCD or following a conservation plan than for those farmers who are neither SCD cooperators nor following a plan. Table 7 illustrates this relationship.

### TABLE 7

### CONSERVATION PRACTICE, BY SCD INVOLVEMENT AND CONSERVATION PLAN, 1977

| CONSERVATION PRACTICE* | U.S. GLB FARMER IS AN SCD COOPERATOR? | | U.S. GLB FARMER IS FOLLOWING A CONSERVATION PLAN? | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|
| | Yes | No | Yes | No | |
| Contour Plowing | 32% | 20% | 29% | 20% | 24% |
| Crop Rotation | 83 | 68 | 83 | 64 | 74 |
| Leave Residue Over Winter | 73 | 56 | 70 | 56 | 63 |
| Grassed Waterway | 56 | 36 | 51 | 36 | 44 |
| No Till Cultivation | 14 | 7 | 12 | 7 | 9 |
| Terrace | 22 | 10 | 18 | 11 | 14 |
| Other | 30 | 12 | 27 | 12 | 19 |
| No Practice | 4 | 15 | 5 | 17 | 11 |

*Note that column percentages would add to more than 100%. This is because each respondent could identify more than one conservation practice. Each percentage is the proportion of farmers, responding as indicated, who said they practice certain conservation measures. For example, 32% of the farmers who said they are SCD cooperators contour plow their fields.

## FACTORS PROMPTING THE USE OF CONSERVATION PRACTICES

Seventy-six percent of the farmers use conservation practices for soil conservation; 49% of the farmers use them to increase yield or production; 8% have other reasons. However, compliance with state/local regulations or availability of cost-share funds were negligible factors in prompting conservation measures. Table 8 shows a breakdown indicating which factors prompted the use of each conservation practice. For example, of those farmers who plow on the contour, 87% do it to conserve soil; 12% do it to increase production.

### TABLE 8

### FACTORS PROMPTING THE USE OF CONSERVATION PRACTICES, 1977

| FACTORS PROMPTING CONSERVATION | CONSERVATION PRACTICE | | | | | | | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|---|---|---|---|
| | Contour Plowing | Crop Rotation | Leave Residue Over Winter | Grassed Waterway | No Till Cultivation | Terrace | Other | No Practice | |
| Conserve Soil | 87% | 53% | 66% | 93% | 60% | 75% | 81% | - | 76% |
| Increase Yield or Production | 12 | 46 | 28 | 6 | 32 | 17 | 8 | - | 49% |
| Comply with State and Local Regulation | - | 0 | - | - | - | - | - | - | 0% |
| Cost-share Funds Available | - | - | - | - | - | 1 | - | - | 0% |
| Other | 1 | 1 | 5 | 2 | 6 | 7 | 10 | - | 8% |
| Total* | 100% | 100% | 100% | 100% | 100% | 100% | 100% | - | 100% |

*Totals for individual practices may not add to 100% due to rounding.

Although soil conservation appears to be the principal factor prompting the use of conservation practices, most respondents actually considered soil conservation and increased yield or production inseparable. Because some farmers gave both soil conservation and increased yield or production as factors prompting the use of conservation practices, the total for all farmers adds up to more than 100%. Nonetheless, it is safe to state that both soil conservation and increased yield or production are the major factors prompting the use of conservation practices.

Factors Prompting the Use of Conservation Practices Compared by SCD Cooperators and Those with a Conservation Plan

When SCD cooperators and those following a conservation plan were asked which factors prompted them to use conservation practices, their responses indicate that involvement with the local SCD and development of a conservation plan are related to factors prompting use of conservation practices. Table 9 indicates that of those responding "yes" to either type of involvement, many more farmers gave the identified factors as reasons, compared to those saying they are not involved, who more often gave "other" reasons for using conservation practices.

## TABLE 9

## FACTORS PROMPTING THE USE OF CONSERVATION PRACTICES AS IDENTIFIED BY SCD COOPERATORS AND FARMERS FOLLOWING A CONSERVATION PLAN, 1977

| FACTORS PROMPTING CONSERVATION* | U.S. GLB FARMER IS AN SCD COOPERATOR? | | U.S. GLB FARMER IS FOLLOWING A CONSERVATION PLAN? | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|
| | Yes | No | Yes | No | |
| Conserve Soil | 89% | 67% | 87% | 65% | 76% |
| Increase Yield or Production | 56 | 44 | 51 | 46 | 49 |
| Comply with State and Local Regulation | 0 | - | - | 0 | 0 |
| Cost-share Funds Available | 1 | - | 0 | - | 0 |
| Other | 6 | 9 | 6 | 11 | 8 |

*Note that column percentages would add to more than 100%. This is because some respondents identified more than one factor as prompting their use of conservation practices. The percentages indicate the proportion of farmers responding a particular way who cited a particular factor. For example, 89% of farmers who said they are SCD cooperators use conservation practices to conserve soil. 56% of SCD cooperators mentioned increased yield or production as a reason.

## FARMERS' OPINIONS CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY

In order to assess the extent to which farmers feel that certain substances resulting from farm operations contribute to water pollution, farmers were asked three questions:

1. In your opinion, does fertilizer and pesticide used in farming contribute to water pollution of the Great Lakes?

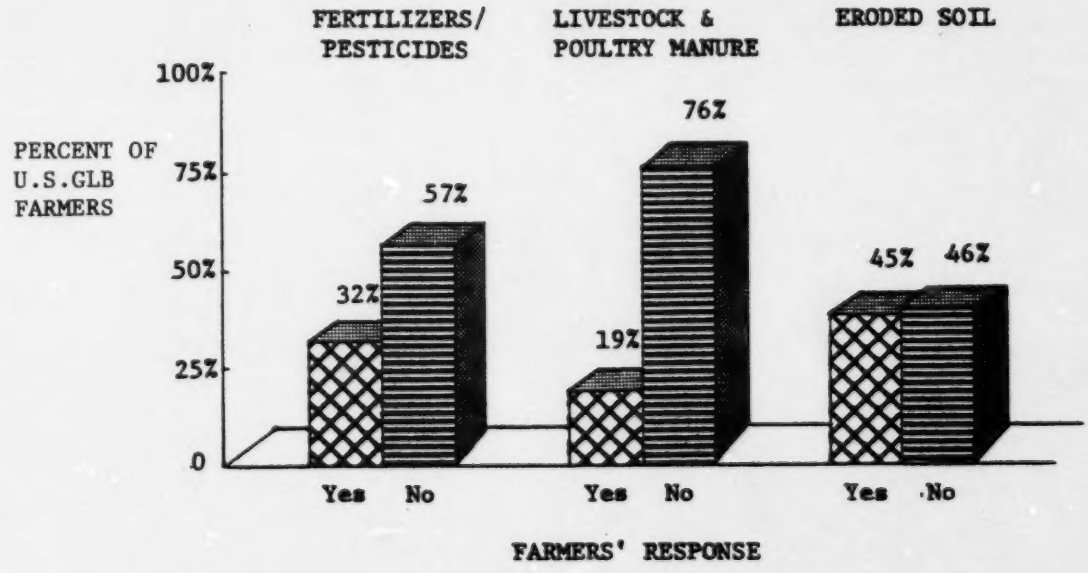
2. In your opinion, does manure from livestock and poultry operations contribute to water pollution of the Great Lakes?

3. In your opinion, does eroded soil contribute to water pollution of the Great Lakes?

The results indicate that the majority of farmers are of the opinion that fertilizers/pesticides, livestock and poultry manure, and eroded soil do not contribute to water pollution of the Great Lakes (see Figure 5).

FIGURE 5

U.S. GREAT LAKES BASIN FARMERS' OPINIONS (1977): DO THESE SUBSTANCES CONTRIBUTE TO POLLUTION OF THE GREAT LAKES?



While soil conservation is reported as a major factor prompting the use of conservation practices, less than half of the respondents believe that eroded soil contributes to water pollution of the Great Lakes. More farmers agree that eroded soil is a pollutant than agree that either fertilizers/pesticides or livestock and poultry manure are pollutants. Certain factors could have influenced these results. Interviewers reported that several people said fertilizer does not contribute to water pollution, but pesticides do. A "yes" to pesticides and a "no" to fertilizer was recorded as "yes" to question 1, thus somewhat overstating the "yes" responses. Concerning all three questions, some respondents indicated that they live too far away from the Great Lakes for their activities to affect the water quality of the Lakes.

Farmers' Opinions Compared by Their Sources of Information About Water Pollution

Sources of information about water pollution were cross-tabulated with opinions concerning land use/water quality relationships to see if different information sources influenced opinions about pollution. The only noticeable difference exists when considering the opinion on eroded soil and information sources. Of those who believe eroded soil contributes to pollution, a higher percentage receive information about water pollution from government representatives and publications, while a lower percentage of those who do not believe eroded soil is a pollutant get their information about pollution from government sources (see Table 10).

## TABLE 10

## FARMERS' OPINIONS CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY, BY SOURCES OF INFORMATION ABOUT WATER POLLUTION, 1977

| DO THESE CONTRIBUTE TO POLLUTION OF THE GREAT LAKES* | SOURCE OF INFORMATION | | | | | |
|---|---|---|---|---|---|---|
| | News., Mags. | Radio | TV | Farm Orgs. | Gov't | Other |
| Fertilizers/Pesticides | | | | | | |
| Yes | 83% | 37% | 42% | 24% | 46% | 9% |
| No | 78 | 35 | 35 | 26 | 41 | 8 |
| Manure | | | | | | |
| Yes | 81% | 29% | 40% | 26% | 41% | 9% |
| No | 80 | 36 | 37 | 24 | 41 | 8 |
| Eroded Soil | | | | | | |
| Yes | 80% | 35% | 38% | 26% | 48% | 8% |
| No | 80 | 36 | 38 | 24 | 35 | 10 |
| ALL U.S. GLB FARMERS | 80% | 35% | 37% | 24% | 41% | 8% |

*Note that all row percentages would add to more than 100%. This is because respondents could identify more than one source of information about pollution. The percentages indicate the proportion of farmers of a particular opinion who obtain pollution information from a particular source. For example, 83% of the farmers who agree that fertilizers/pesticides contribute to pollution, obtain information about pollution from newspapers and magazines.

Farmers' Opinions Compared by Type of Farm

Farmers' opinions concerning the effect of certain substances on water quality do not vary significantly when one compares these opinions and the type of farm operated, as Table 11 illustrates. Operators of field crop, vegetable and fruit, and livestock and poultry farms all agree and disagree about contributors to water pollution in percentages similar to one another and to those for the entire U.S. Basin. It is interesting to note that the opinion of livestock and poultry farm operators concerning manure is not much different from other farm operators. Operators of field crop farms have a tendency to agree more often than other farmers that fertilizers/pesticides and soil erosion contribute to water pollution of the Great Lakes.

## TABLE 11

## FARMERS' OPINIONS CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY, BY TYPE OF FARM, 1977

| DO THESE CONTRIBUTE TO POLLUTION OF THE GREAT LAKES? | TYPE OF FARM | | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|
| | Field Crops | Veg. & Fruit | Livestock & Poultry | |
| Fertilizers/Pesticides* | | | | |
| Yes | 37% | 31% | 27% | 32% |
| No | 52 | 51 | 63 | 57 |
| No Opinion | 11 | 18 | 10 | 11 |
| Manure* | | | | |
| Yes | 21 | 22 | 17 | 19 |
| No | 75 | 69 | 78 | 76 |
| No Opinion | 4 | 9 | 5 | 5 |
| Eroded Soil* | | | | |
| Yes | 49% | 45% | 41% | 45% |
| No | 43 | 45 | 50 | 46 |
| No Opinion | 8 | 10 | 9 | 9 |

*Column responses add to 100% for each substance.

In a related sense, livestock or poultry ownership was compared to farmers' opinions on manure with insignificant results. Of farmers who own livestock or poultry (72% of all U.S. Great Lakes Basin farmers) 19% agree that manure contributes to Great Lakes water pollution; of those who don't own any, 20% agree that manure is a pollutant. Disagreement that manure contributes to pollution was similar: 77% of livestock and poultry owners; 75% of non-owners.

## Farmers' Opinions Compared by Gross Farm Sales

Operators of farms, classified by gross farm sales, vary in their opinions concerning the effect of certain farming activities on water quality. Among operators of farms grossing less than $2,500, many (47%) believe that fertilizers/pesticides contribute to Great Lakes water pollution, while a much lower percentage of those grossing more than $10,000 believe that fertilizers/pesticides are pollutants (see Table 12). Opinions regarding manure and eroded soil do not vary substantially by gross farm sales, however.

### TABLE 12

### FARMERS' OPINIONS CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY, BY GROSS FARM SALES, 1977

| DO THESE CONTRIBUTE TO POLLUTION OF THE GREAT LAKES? | U.S. GLB FARMERS WITH GROSS FARM SALES: Under $2,500 | $2,500-9,999 | $10,000-39,999 | $40,000 & Over | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|
| Fertilizers/Pesticides* | | | | | |
| Yes | 47% | 32% | 21% | 17% | 32% |
| No | 43 | 56 | 70 | 71 | 57 |
| No Opinion | 10 | 12 | 9 | 12 | 11 |
| Manure* | | | | | |
| Yes | 22% | 17% | 18% | 18% | 19% |
| No | 74 | 78 | 77 | 75 | 76 |
| No Opinion | 4 | 5 | 5 | 7 | 5 |
| Eroded Soil* | | | | | |
| Yes | 49% | 42% | 45% | 41% | 45% |
| No | 40 | 50 | 47 | 52 | 46 |
| No Opinion | 11 | 8 | 8 | 7 | 9 |

*Column responses add to 100% for each substance.

## Farmers' Opinions Compared by Conservation Practice

For the most part, farmers' opinions concerning the effect of agricultural activities on water quality are similar, regardless of their choice of conservation practices (see Table 13). The most substantial differences occur when comparing the opinions on eroded soil of farmers who contour plow and those who practice other methods of conservation. Those who contour plow their fields agree more often than other farmers that eroded soil contributes to water pollution of the Great Lakes. Conversely, they also disagree more often that eroded soil is a pollutant. These same farmers also have a slight tendency to agree more often than other farmers that fertilizers/pesticides contribute to pollution. Farmers who rotate crops have a minor tendency to disagree more often than those following other practices concerning all three groups of substances contributing to water pollution.

### TABLE 13

### FARMERS' OPINIONS CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY, BY CONSERVATION PRACTICE, 1977

| DO THESE CONTRIBUTE TO POLLUTION OF THE GREAT LAKES? | CONSERVATION PRACTICE | | | | | | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|---|---|---|
| | Contour Plowing | Crop Rotation | Leave Residue Over Winter | Grassed Waterway | No Till Cultivation | Terrace | Other | |
| Fertilizer/Pesticides* | | | | | | | | |
| Yes | 36% | 31% | 32% | 35% | 31% | 34% | 34% | 33% |
| No | 56 | 61 | 57 | 58 | 61 | 59 | 59 | 58 |
| No Opinion | 8 | 8 | 11 | 7 | 9 | 7 | 7 | 9 |
| Manure* | | | | | | | | |
| Yes | 22% | 18% | 19% | 22% | 20% | 20% | 22% | 20% |
| No | 75 | 78 | 77 | 75 | 78 | 75 | 75 | 76 |
| No Opinion | 3 | 4 | 4 | 3 | 2 | 5 | 3 | 4 |
| Eroded Soil* | | | | | | | | |
| Yes | 56% | 46% | 48% | 48% | 50% | 50% | 49% | 48% |
| No | 37 | 47 | 45 | 44 | 46 | 42 | 44 | 45 |
| No Opinion | 7 | 7 | 7 | 8 | 4 | 8 | 7 | 7 |

*Column responses add to 100% for each substance.

Farmers' Opinions Compared with Degree of SCD Involvement and Development of a Conservation Plan

Those farmers who cooperate with the local SCD and those who have conservation plans have opinions that are similar to those held by all farmers. The largest differences occur when considering fertilizers/pesticides as contributors to water pollution. SCD cooperators and farmers with a conservation plan disagree more often than average that fertilizers/pesticides are sources of water pollution, as Table 14 indicates. Surprisingly though, these groups do not agree in any greater percentages than for farmers in general, that eroded soil is a contributor to water pollution of the Great Lakes.

TABLE 14

OPINIONS OF SCD COOPERATORS AND THOSE FOLLOWING A CONSERVATION PLAN CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY, 1977

| DO THESE CONTRIBUTE TO POLLUTION OF THE GREAT LAKES? | U.S. GLB FARMER IS AN SCD COOPERATOR? | | ALL U.S. GLB FARMERS | U.S. GLB FARMER FOLLOWS A CONSERVATION PLAN? | | ALL U.S. GLB FARMERS |
|---|---|---|---|---|---|---|
| | Yes | No | | Yes | No | |
| Fertilizers/Pesticides* | | | | | | |
| Yes | 28% | 36% | 32% | 30% | 35% | 32% |
| No | 65 | 52 | 57 | 63 | 52 | 57 |
| No Opinion | 7 | 12 | 11 | 7 | 13 | 11 |
| Manure* | | | | | | |
| Yes | 19% | 20% | 19% | 18% | 21% | 19% |
| No | 76 | 76 | 76 | 78 | 74 | 76 |
| No Opinion | 5 | 4 | 5 | 4 | 5 | 5 |
| Eroded Soil* | | | | | | |
| Yes | 45% | 45% | 45% | 47% | 43% | 45% |
| No | 48 | 45 | 46 | 45 | 47 | 46 |
| No Opinion | 7 | 10 | 9 | 8 | 10 | 9 |

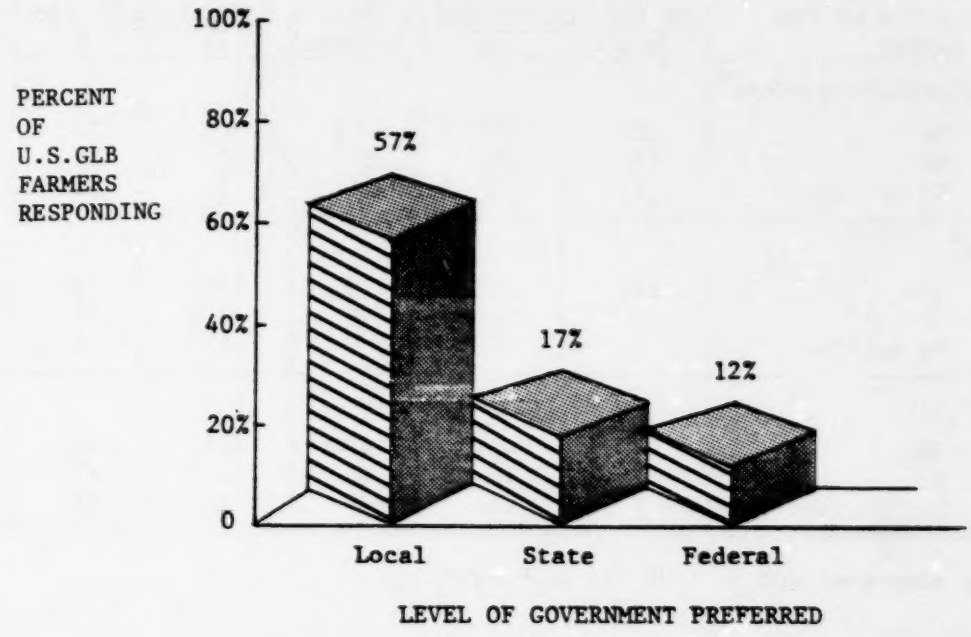
*Column responses add to 100% for each substance.

## FARMERS' ATTITUDES CONCERNING POLLUTION ABATEMENT ISSUES

Farmers were asked what level of government they thought would do a better job of administering regulations, if they were needed: local, state or federal government. The majority (57%) chose local government; 17% opted for state government and only 12% preferred the federal level. Figure 6 illustrates these results.

FIGURE 6

U.S. GREAT LAKES BASIN FARMERS' OPINIONS (1977):
WHAT LEVEL OF GOVERNMENT WOULD DO A BETTER JOB
OF ADMINISTERING REGULATIONS, IF THEY ARE NEEDED?



Farmers were asked to express their agreement or disagreement with four statements. Nearly three-quarters of the respondents (71%) agree that to solve farm-related water pollution problems, it is best to rely on voluntary cooperation of farmers. More than three quarters (77%) agree that farmers need more information on how they can control water pollution. Two-thirds (67%) agree that the federal government should help pay for pollution control on farms; similarly, almost two-thirds (60%) disagree that farmers should pay the entire cost of controlling water pollution created by their own operations. Table 15 shows these results.

## TABLE 15

## FARMERS' ATTITUDES CONCERNING POLLUTION ABATEMENT ISSUES, 1977

| STATEMENTS ON WATER POLLUTION ABATEMENT ISSUES | U.S. GLB FARMERS' RESPONSES | | |
|---|---|---|---|
| | Yes | No | No Opinion |
| It is best to rely on voluntary cooperation of farmers. | 71% | 22% | 8% |
| Farmers need more information on how they can control water pollution. | 77 | 18 | 5 |
| The Federal government should help pay for pollution control on farms. | 67 | 26 | 7 |
| Farmers should pay the entire cost of controlling water pollution on their farms. | 31 | 60 | 9 |

Farmers' Attitudes by Government Preference

It makes no difference what government level a farmer prefers as to whether or not that farmer agrees with the various statements in the questionnaire concerning water pollution issues.

Farmers' Attitudes by Their Sources of Information About Water Pollution

Farmers' sources of information about water pollution do not have any significant effect on their attitudes concerning pollution issues.

Farmers' Attitude Concerning more Information Needed by Sources of Information About Water Pollution

Farmers who agree that they need more information on how they can control water pollution use the same sources of information, proportionately, as farmers who disagree.

## Farmers' Attitudes by Their Opinions on Water Quality Relationships

Farmers' opinions concerning the effect of certain agricultural activities on water quality do vary, depending on attitudes those farmers may have toward water pollution abatement issues.

The 71% of U.S. Great Lakes Basin farmers who think it is best to rely on voluntary cooperation express disagreement proportionately more than farmers as a whole that certain substances affect water quality. Conversely, those who do not want to rely on voluntary cooperation express agreement in higher percentages than average that fertilizers/pesticides, manure, and eroded soil contribute to water pollution of the Great Lakes.

Of the 77% of Basin farmers who believe that farmers need more information on how they can control water pollution on their farms, higher percentages than average are of the opinion that fertilizer/pesticides, manure, and eroded soil are pollutants. Conversely, those who don't think farmers need more information have a tendency to disagree more (proportionately) that certain substances contribute to water pollution. Table 16 identifies the percentages of farmers agreeing/disagreeing with various statements that certain substances affect water quality. For example, 29% of the farmers who think it's best to rely on voluntary cooperation are of the opinion that fertilizer/pesticides contribute to water pollution of the Great Lakes.

## TABLE 16

## FARMERS' ATTITUDES CONCERNING POLLUTION ABATEMENT ISSUES, BY THEIR OPINIONS REGARDING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY, 1977

| STATEMENTS ON WATER POLLUTION ABATEMENT ISSUES | DO THESE CONTRIBUTE TO POLLUTION OF THE GREAT LAKES? | | | | | |
|---|---|---|---|---|---|---|
| | FERTILIZERS/ PESTICIDES | | MANURE | | ERODED SOIL | |
| | Yes | No | Yes | No | Yes | No |
| It is best to rely on voluntary cooperation of farmers. | | | | | | |
| Agree | 29% | 61% | 16% | 79% | 43% | 49% |
| Disagree | 49 | 45 | 31 | 66 | 56 | 39 |
| Farmers need more information on how they can control water pollution. | | | | | | |
| Agree | 36% | 54% | 22% | 74% | 50% | 41% |
| Disagree | 23 | 71 | 9 | 87 | 29 | 65 |
| The best administrator of regulations, if needed is: | | | | | | |
| Federal | 45% | 51% | 30% | 69% | 48% | 44% |
| State | 40 | 53 | 20 | 76 | 55 | 39 |
| Local | 30 | 59 | 18 | 77 | 43 | 49 |
| ALL U.S. GLB FARMERS | 32% | 57% | 19% | 76% | 45% | 46% |

Attitudes concerning other issues were not included in this table because farmers grouped by their opinions concerning other water pollution abatement issues differ substantially from farmers as a whole.

# SUMMARY AND CONCLUSIONS

## CHARACTERISTICS OF FARMS

Field crops provide the main farm income for about half of the farmers in the U.S. Great Lakes Basin. Almost all of the remainder are principally livestock and poultry farmers; only 5% derive most of their gross sales from vegetables and fruits. About three-quarters of all farmers own livestock and poultry.

More than half of the resident farm operators report annual gross sales from their farms of less than $10,000. One-third report sales of less than $2,500. Thus, many of the farms in the U.S. Great Lakes Basin may be small operations.

## FARMERS' SOURCE OF INFORMATION ABOUT WATER POLLUTION

Eighty percent of the farmers in the Basin obtain information regarding water pollution from newspapers and magazines. Radio and television together were reported by 72% of the farmers, or by nearly as many farmers as newspapers and magazines. Implications are that any public information effort should be focused in particular on newspapers and magazines, and radio and television, to reach the largest number of farmers.

## CONSERVATION PRACTICES FOLLOWED

About nine out of ten farmers (89%) in the U.S. Great Lakes Basin practice some conservation measures, with the largest percentages rotating crops (74%) and leaving crop residue on land over winter (63%). Even 78% of the operators of the smallest dollar-producing farms (those earning less than $2,500 in gross sales) practice some conservation. Of those farmers who have a clearly defined stream or ditch beside their cultivated fields, nearly two-thirds (63%) cultivate 10 feet or more from that stream or ditch.

About 40% of U.S. Great Lakes Basin farmers say they are cooperators of a local soil conservation district and half say they follow a conservation plan. Survey results show these farmers are more likely to practice conservation than non-cooperators and those not following a conservation plan.

## FACTORS PROMPTING THE USE OF CONSERVATION PRACTICES

The major factors prompting the use of conservation practices are soil conservation and increased yield or production. Compliance with state or local regulations and the availability of cost-sharing funds were seldom mentioned as factors.



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## FARMERS' OPINIONS CONCERNING THE EFFECT OF AGRICULTURAL ACTIVITIES ON WATER QUALITY

Most farmers do not believe that there is a relationship between fertilizer/pesticides, manure, or eroded soil, and Great Lakes water quality. Only 19% believe manure contributes to water pollution of the Great Lakes; only 32% agree that fertilizers/pesticides are pollutants; yet almost half consider eroded soil a contributor to water pollution.

A farmer's sources of information regarding water pollution do not determine to any great extent opinions on water quality/land use relationships, although those who mention the government as a source of information on pollution agree more often than other farmers that eroded soil contributes to water pollution.

However, opinions concerning fertilizers/pesticides as causes of water pollution do vary when comparing farmers with different gross farm sales. Operators of farms with gross annual sales of less than $2,500 agree more often than other farmers that fertilizers/pesticides contribute to water pollution of the Great Lakes (47% compared to 32%). As gross farm sales increase, percentages decrease for those agreeing that fertilizers/pesticides pollute. Only 17% of the operators of farms with highest gross sales agree that fertilizers/pesticides contribute to water pollution.

## FARMERS' ATTITUDES CONCERNING WATER POLLUTION ABATEMENT ISSUES

The majority (57%) of farmers express the view that local government would do the best job of administering regulations, if they were needed. Only 17% select state government and only 12%, federal government. Implications are that, given the existing institutional arrangements, a local governmental unit, such as a soil and water conservation district, may be acceptable to farmers.

Nearly three-quarters (71%) of the respondents state that it is best to rely on voluntary cooperation of farmers to solve farm-related water pollution problems. This view seems to corroborate the conclusion that existing soil conservation districts, which do rely on voluntary cooperation, may be acceptable to farmers for implementation of pollution abatement programs.

However, more than three-quarters (77%) of the U.S. Great Lakes Basin farmers agree that farmers need more information on how they can control water pollution. This result suggests that public information programs need to be expanded if water pollution abatement recommendations are to be successfully implemented.

Two-thirds of the farmers agree that the federal government should help pay for water pollution control on farms. Nearly two-thirds (60%) disagree that farmers should bear the entire cost. The implication of these views is that to gain widespread implementation of pollution abatement programs, the federal government should help pay the costs, as it has done in the case of municipalities.

# GLOSSARY

*farm* - a production unit with sales of agricultural products from the area of land associated with the product. Included are places of 10 or more acres and $50 or more of agricultural sales in the most recent year or places of less than 10 acres and sales of at least $250.

*farmer* - for the purpose of this survey, a farmer is the farm operator.

*farm operator* - the person responsible for day-to-day farm-related decisions on the land operated.

*farm type* - farm where the largest percentage of total sales consists of a particular type of product.

*field crops* - includes cash grains, dry beans, potatoes, hay, sugar beets, and miscellaneous products (such as nurseries and greenhouses).

*livestock and poultry* - includes cattle, hogs, milk, chickens, eggs, and other livestock and poultry products.

*resident farm operator* - farm operator living inside a sample area designated by the Statistical Reporting Service of the U.S. Department of Agriculture. These sample areas are representative of all the land area in the Great Lakes region.

*U.S. Great Lakes Basin* - the land area located in the United States that is drained by rivers and their tributaries into the Great Lakes. For the purpose of this survey, it includes all counties with at least half the land draining into the Great Lakes.

*vegetables and fruits* - includes all vegetable and melon crops, berries, tree fruits, and grapes.